

## Item #47: Sediment Yield

**Evaluation Objectives:** To determine if changes are occurring in sediment yields as a result of land management activities, and to validate the sediment yield coefficients used in watershed modeling (R1WATSED).

**Methods:** No direct measurements of sediment yield were conducted during this monitoring period.

**Evaluation:** Since the 1986 Forest Plan was adopted, a great deal has been learned about the inherent complexity and variability of hillslope erosion, sediment delivery, and in-stream sediment transport. Past Forest Plan monitoring reports have documented problems and limitations in attempting to address this monitoring item. Use of the R1 WATSED model has declined in recent years as more advanced technology has been developed. The primary concern about using R1 WATSED is that it is not supported by peer reviewed research. In addition, the WATSED model was developed to address yield of sediment at the watershed scale. Validation of sediment yield coefficients and/or sediment yield at this scale would be extremely difficult in light of the latest research about sediment delivery and transport through stream networks. In a comprehensive assessment of the current knowledge related to sediment transport and yield at the watershed scale, Bunte and MacDonald (1999) concluded the following: *“We should not expect to detect less than a twofold change in sediment transport rates or sediment yields.....Changes in measurement techniques, calculation procedures, or the period of comparison can create the appearance of sediment Cumulative Watershed Effects (CWEs) when none actually exists. The inherent spatial and temporal variability suggests that at least 5-10 years of both pre and post monitoring area likely to be necessary to reliably detect a sedimentary CWE. A universal sedimentary CWE model is simply not realistic given the diversity and complexity of sediment production, transport, and delivery processes”*. Given these complexities, current budgets cannot possibly support the long term data collection and intensive analyses that are needed to fully address this monitoring item. In addition, there is no guarantee that such an effort would generate credible results.

Given the challenges associated with sediment yield and the WATSED model, sediment remains a critical issue in watershed management. A new suite of erosion and sediment transport models, called the Forest Service WEPP Interfaces have been in development since the late 1990s. These models are process-based, and they are widely used in the Forest Service to predict erosion and sediment delivery rates. In contrast to WATSED, these models focus on the hillslope scale where it is most important to address erosion and sediment delivery. The WEPP interface models are well suited for project-level planning, and numerous papers have been published that address the applications, limitations, and accuracy of the WEPP interfaces (<http://forest.moscowfs1.wsu.edu/cgi-bin/engr/library/searchpub.pl>).

Even though there is limited potential to model sediment yields at the watershed scale, it is still possible to explore how sediment may be affecting streams and water quality across the forest. Components of the PACFISH/INFISH Biological Opinion (PIBO) dataset can be useful surrogates for sediment yield or delivery, particularly the median particle size. All PIBO

sampling sites are located in “response” reaches, or low gradient streams (gradient < 5%). Response reaches are typically where sediment impacts are most likely to be detected or reflect upstream processes and/or impacts. Stream habitat metrics such as residual pool depth, particle size distribution, percent pools, and percent fines can be useful surrogates for sediment yield. Monitoring item #27 provides a detailed discussion and comparison of these habitat parameters in reference and managed watersheds.

**Recommended Action:** Even though it is extremely difficult to address this monitoring item at the watershed scale, sediment still remains the pollutant of most concern related to management activities. It is recommended that sediment yield continue to be reported, but using surrogate parameters in the PIBO monitoring program.